

REMARKS

Claims 1-14 were originally presented. Claims 15-20 have been canceled without prejudice or disclaimer in response to a restriction requirement and Applicants respectfully reserve the right to pursue these and other claims in a divisional patent application.

Claims 3 and 9 are canceled herein and claims 21-26 are newly added. Thus, claims 1-2, 4-8, 10-14 and 21-26 are all the claims presently pending in the application.

Claims 1-14 currently stand rejected on prior art grounds. Applicants respectfully traverse these rejections based on the following discussion.

The Abstract is objected to and is amended herein in order to overcome the objection.

I. The Prior Art Rejections

Claims 1-14 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Yang, et al. (U.S. Patent No. 5,868,843), in view of Mahvan, et al. (U.S. Patent No. 5,614,071), hereinafter referred to as Mahvan. Applicants respectfully traverse these rejections because the cited prior art references do not teach or suggest the desirability of the proposed combination and further do not teach or suggest all of the claim limitations.

A. Summary Of The Cited Prior Art References And The Present Invention.

Per the Abstract, Yang teaches a detachable sponge device for a spin coating machine used to coat a liquid material over a semiconductor wafer is provided. The detachable sponge device is used to prevent a solvent (that is jetted only on the edge of the wafer to remove a bead of the coating material on the wafer's edge) from being oversprayed elsewhere on the wafer. The

detachable sponge device is composed of a curved mounting piece and a corrugated piece of sponge attached on the curved inner side of the mounting piece. The mounting piece can be detachably mounted on the spin coating machine. The corrugated piece of sponge can absorb splattered particles of solvent from the wafer which can thus be prevented from bouncing back onto the wafer. The planarization of the coating of SOG on the wafer thus will not be affected by splattering particles of the solvent. Excellent results of planarization of SOG or photoresist layers can thus be achieved.

Per the Abstract, Mahvan teaches a shield for use in a sputtering system. The shield includes a support having an inner expanse defining a two-dimensional array of cavities. The cavities are formed of two-dimensionally concave wall surfaces, where the intersections of the wall surfaces of adjacent cavities form a two-dimensional array of edges on the expanse. The shield minimizes the tendency of material deposited on the shield surface, such as sputtered carbon material, from flaking off during a sputtering operation. Also disclosed is a sputtering assembly that employs the shield.

Like Yang, the present invention similarly provides an apparatus with a shield capable of capturing overspray of a solvent or cleaning fluid from a rotating wafer. However, the present invention is designed not just to capture such overspray, but to prevent the fluid and foreign matter particles that are ejected from the surface of the wafer from forming a mist and being re-deposited back onto the wafer.

B. Lack Of Suggestion/Motivation To Combine.

The Applicants submit that there is no suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art,

to combine the teachings of Yang and Mahvan. Specifically, it is generally understood that the teaching, suggestion, or motivation to combine references “must be found either explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art and that the “test for an implicit showing is what the combined teachings, knowledge of one of ordinary skill in the art, and the nature of the problem to be solved as a whole would have suggested to those of ordinary skill in the art.” (see *In re Kotzab*, 217 F.3d 1365, 1370, 55 USPQ2d 1313, 1317 (Fed. Cir. 2000)). The Applicants submit that a motivation to combine the references is not explicitly or implicitly shown in the references because, while both references teach wafer shields, the purpose and functions of the respective shields (i.e., the natures of the problems to be solved) are significantly different.

Specifically, as discussed above, Yang teaches a corrugated piece of sponge used to absorb splattered solvent from a rotating wafer which can thus be prevented from bouncing back onto the wafer. Mahvan on the other hand teaches a shield for use in a sputtering system (i.e., in a system that deposits ejected atoms of a material, such as carbon, onto a substrate). Mahvan discloses that a typical sputtering shield has a smooth surface and is used to receive wide-angle deposition of atoms (e.g., carbon) that are not directed against the target (see col. 1, lines 30-38). That is, the shield of Yang is designed *to limit splatter from a fluid directed to the wafer*, whereas the shield in Mahvan is designed *to capture atoms ejected not at the wafer, but rather at a wide-angle away from the wafer*. Additionally, as discussed in detail at col. 4, line 56-col. 5, line 20, Mahvan noted that sputter material deposited on a smooth shield has a tendency to flake off the shield over time as a result of shield buckling in response to global thermal expansion/contraction, when the sputtering shield is heated then cooled. Therefore, the shield structure of Mahvan is designed to minimize flaking by depositing atoms into cavities on the

shield surface. These cavities minimize the compressive forces acting on the deposited material.

Given the shields of Yang and Mahvan are designed to receive different materials (e.g., fluid vs. atoms), to receive the different material in different manners (i.e., splattering from the wafer vs. direct wide-angle ejection from a sputtering system), to interact differently with the different materials (i.e., absorption vs. deposition) and to solve different problems related to the different materials (i.e., to eliminate immediate back splattering onto the wafer vs. to eliminate flaking into the sputtering plasma overtime), the Applicants submit that the teachings of the cited prior art and the knowledge of one of ordinary skill in the art, as a whole, would not have suggested the desirability of the claimed invention.

C. All Claim Limitations Are Not Taught Or Suggested.

The Applicants further submit that neither Yang, nor Mahvan, teach or suggest the feature in amended independent claim 1 of “wherein a surface of said shield facing said substrate comprises a semi-permeable material adapted to prevent said fluid and said foreign matter particles from forming into a mist and being re-deposited back on said substrate.” The Applicants further submit that neither Yang, nor Mahvan, teach or suggest the following features in amended independent claim 8: (1) “wherein a surface of said shield facing said semiconductor wafer comprises a semi-permeable material having absorptive fins”; and (2) wherein said semi-permeable material with said absorptive fins prevents said cleaning fluid and said foreign matter particles from forming into a mist and being re-deposited back on said semiconductor wafer.” Finally, the Applicants submit that neither Yang, nor Mahvan, teach or suggest the following features in newly added independent claim 21: (1) “a disposable liner on a surface of said shield facing said substrate”; (2) “wherein said disposable liner comprises a semi-permeable membrane

having vertically oriented fins and one of perforations and screen openings facing said substrate'; and (3) "wherein said semi-permeable membrane with said vertically oriented fins and said one of said perforations and said screen openings prevents said fluid and said foreign matter particles from forming into a mist and being re-deposited back on said substrate."

More particularly, as discussed above, Yang teaches a detachable sponge device composed of a curved mounting piece and a corrugated piece of sponge attached to the mounting piece to absorb splattered solvent jetted at the wafer's edge from bouncing back onto the wafer surface (see Abstract). The shield of Mahvan is cited by the Examiner only as disclosing the feature of a shield which completely surrounds the substrate. The present invention goes beyond a shield surrounding a wafer for eliminating back splatter onto the wafer surface (as the combination of Yang and Mahvan suggests) to a shield designed to eliminate mist formation and, thereby, to eliminate redeposition of foreign matter particles onto the wafer surface.

More specifically, the present invention identified a problem associated conventional clean stations used to clean the entire surface of the substrate. Specifically, during the substrate surface cleaning process, a mist of cleaning fluid and foreign matter particles can accumulate within the shield and cause the foreign matter particles to be re-deposited on the cleaned wafer (see paragraphs [0004]-[0005]). The present invention does not just prevent back splatter problem identified by Yang, but rather provides a shield lined with a semi-permeable semiconductor material that is particularly adapted to prevent cleaning fluid and foreign matter particles that are ejected from the substrate from forming into such a mist (see paragraphs [0017]-[0018]. For example, the semi-permeable material liner can comprise perforations or screen openings facing the substrate and/or can comprise fins (see Figures 2-3 and paragraph [0017]). The fins can be vertically oriented (as illustrated in Figure 3), can be absorptive and can

also provide air flow and fluid flow control (see paragraph [0017]). Furthermore, as discussed in paragraph [0018], the semi-permeable material/membrane can be in the form of a disposable liner or can be a permanent part of the shield.

Yang only discusses back splatter, not mist formation, and nothing in the Yang disclosure teaches or suggests that the sponge device of Yang is further adapted to prevent this mist formation. That is, as discussed above, the present invention incorporates a shield liner (i.e., the semi-permeable material/membrane) having openings or perforations that face the substrate surface and/or fins to prevent mist formation. Yang discloses a sponge device (not a liner) that attaches to a portion of the shield and that has a smooth corrugated surface (see Figure 3 of Yang). While this sponge material on the shield of Yang may be absorptive and, thereby, capable of performing the task for which it was design (namely, preventing back splatter), it alone without the screen openings, perforations and/or fins of the present invention would not be sufficient to eliminate mist formation.

Therefore, amended independent claims 1 and 8, as well as newly added independent claim 21 are patentable over Yang and Mahvan. Further, dependent claims 2, 4-7, 10-14, and 22-26 are similarly patentable, not only by virtue of their dependency from a patentable independent claim, but also by virtue of the additional features of the invention they define. Moreover, the Applicants note that all claims are properly supported in the specification and accompanying drawings, and no new matter is being added. In view of the foregoing, the Examiner is respectfully requested to reconsider and withdraw the rejections.

II. Formal Matters and Conclusion

With respect to the objection to the Abstract, the Abstract has been amended, above, to

overcome the objections. In view of the foregoing, the Examiner is respectfully requested to withdraw the rejection.

With respect to the rejections to the claims, the claims have been amended, above, to overcome these rejections. In view of the foregoing, the Applicants submit that claims 1-2, 4-8, 10-14 and 21-26, all the claims presently pending in the application, are patentably distinct from the prior art of record and are in condition for allowance. Therefore, the Examiner is respectfully requested to reconsider and withdraw the rejections to the claims and to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary. Please charge any deficiencies and credit any overpayments to Attorney's Deposit Account Number 09-0456.

Respectfully submitted,

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